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India, Sustainable Agriculture

Sustainable Ecosystems for a Changing India

For much of its modern history, India's agriculture sector has been struggling to meet the demands of population growth. Roughly 1 out of 5 inhabitants of the world live in India, whose area is just 2.5% of the world's (Orgi). During the 1950s and 60s, the Green Revolution brought new types of high-yielding wheat and rice into agricultural practices to India, which increased food production for the rapidly growing populations and shielded more than a billion people from starvation. However, the UN's modern definition of food security demands nutritional security and food choice in addition to sheer calories, neither of which were met then or are being met now. The Green Revolution also introduced costly practices: synthetic fertilizers, chemical pesticides, and widespread pumped irrigation, which have had long-standing consequences. Thus many wonder if, in the long run, the Green Revolution was enough for India; and whether a new revolution that values sustainability would do better in its place.

Today, according to Indian Food Banking Network, India has about 196 million people going hungry every day. It is also the country with the largest malnourished population in the world (around 17.5% of the population), even though it is ranked second in farm output worldwide. This malnutrition also has a concerning gender dimension, as an astounding 87% of pregnant women are anemic (which in turn causes maternal mortality and stunts the next generation), while 47% of adolescent girls are underweight, with 56% suffering from iron or vitamin B deficiencies. This amounts to 70% of Indian women and children with serious nutritional deficiencies, not to mention differing disadvantages in food security between castes, tribes, and minority groups (AVARD).

There are three apparent causes why the statistics are not more encouraging. First, the government cut rural development spending during the early 90s (Upadhyay). Since then, there has been little to no innovation in variety of food production, and although India produces enough to feed its 1.339 billion, the food produced does not provide the nutritional value and choice needed for a diet to be secure. In addition, the government pays farmers little to nothing for the staple crop needed for the highly essential Public Distribution System (PDS)(Swaminathan). Second, food access is limited. Half of urban slums are not reached by the subsidised PDS and must try to find expensive food in the market. On top of this, PDS dealers are not supervised, and many begin to sell the subsidised crops to normal store owners at market prices, leaving PDS stores empty. Third, currently 33% of India's population is urban, expected to rise to almost 50% by 2050, as rural young males move to cities to escape distress (Chamie), resulting in a feminization of poverty. This will put additional expansion pressures on the already strained urban environments, and leave rural areas struggling to produce enough food for a growing population. The urban expansion and corresponding reduction in arable land, estimated at 30% (Evergreen), could be disastrous for both urban and rural areas.

When as part of the Green Revolution, the Indian government introduced the PDS, it focused only on calories, requiring the new high-yield cereals to be harvested in bulk with no variety. This led to an expansion of industrial or conventional farms created by the British in India, modeled after the large-scale versions in 'developed' countries, and thus brought environmental and social issues that had never been encountered before (Ramachandran). Worldwide, industrial farming destroys environments by depleting the water levels, and killing soil microbes. The result of this is drought and soil erosion that destroys a total of ten million hectares every year (A1- 1). Large operations also call for monocultures that make harvesting by machine easier, but are known to leave crops increasingly vulnerable to pests and diseases. On a larger scale, industrial farms produce such large amounts of greenhouse gases through their

processing systems, that they match emissions from large urban areas, worsening the world's already very large carbon footprint (Gilbert).

The social impact of industrial farms is equally disturbing. In many places, industrial farms crowd smallholders out of their local markets, and buy up rural community resources to ship to urban consumers. This can also make it much harder for women and minorities around the world to enter into contract farming agreements that allow them to earn their own livelihoods (Perry). In India, where farmers had been farming organically and socially for thousands of years, such an influx of new methods not only caused many to completely forget those old ways (like how to best utilize India's monsoon rains), but also puts many in a position now, where they need to take out loans on the more resilient high-input seeds and do increasingly harsh labor to make up for limited access to mechanization (Ians). This leads to extreme water scarcity, urbanization, and more and more often, farmer suicides. All of which have left many rural areas barren and villages crumbling.

Because more than half of the population India today lives in rural areas and relies on farming for livelihood, the average family is most likely in the agriculture business. To see the hardships of daily life in a rural area, take the example of a family living in Perambalur district of the Indian state of Tamil Nadu, a historically agricultural area that now suffers from chronic drought (Perambalur District). Most likely this family would be small landowning farmers that own about 1 hectare (2.47 acres) of land and produce mostly rice and wheat. They have been on the land for almost seven generations, initially making a living off producing a variety of foods, but in the past sixty years, they have produced only cereals and cash crops that are bought by the PDS to quell a full-blown famine. Even that minimum payment from the PDS is now becoming obsolete, as dumped grains from other heavily subsidised agricultural nations such as Australia, Ukraine and France, have begun to crowd out local producers (Singh, Ajeet). Attaining a living is now much harder with sudden heat waves and crop loss, and there have been many stories of farmers committing suicide because they are unable to support themselves or pay off debts. Of the family's three children ranging from the ages of 8 to 19, the older two have left for the city, searching for better opportunity but getting employment in menial jobs that pay about 272 INR (\$3.93 USD) per day (India Average). The youngest is attending a government school that has too many students per teachers, and will leave the children without the necessary knowledge to make a living above minimum wage. In addition, childhood malnutrition because of a lifetime of living off PDS grain, and constant illnesses from a lack of sanitation facilities, hinders their ability to learn from the moment they reach a schooling age.

By contrast, sustainable agriculture promises to reverse some of these terrible side effects of the industrial farming approach, and hopefully provide longer-lasting food security to coming generations. It engages and empowers the community, local markets, and geography of each area to boost smallholders' profits and tackle environmental problems. In India, this would mean a combination of conventional and organic systems, to make farms conscious of the surrounding ecosystem but still realistic for the food needs of the growing population (Singh, Ram). Traditional organic agriculture creates new ecosystems adapted to local environments, designs systems of crop rotation that optimally deposit and reuse nutrients in the soil, and/or plants trees and shrubs as a protection from water erosion and as an extra source of income for the farm. In addition to general farm health, Organic systems promote variety in types of crop, in order to dissuade pests, and aim to have smallholders cover all of their food and fiber needs from their own farms. But since there has not yet been sufficient evidence that purely organic agriculture achieves the necessary yields for food security, more modern attempts at sustainable agriculture that use some amount of chemical input and biotechnology may be necessary. This could, however, only be done with close coordination with the farmers, allowing them to incorporate their own deep knowledge and experience of local conditions into the innovations, and with an assurance of zero-carbon footprint technologies that do not compromise the surrounding ecology. Only then are they considered sustainable. In short, *sustainable agriculture does whatever needs to be done to make farming economically viable for many*

generations of farmers to continue, and guarantees food security, both in nutritional value and accessibility.

Though India has had its problems with industrial agriculture, it has also had its history with people and organizations willing to commit to sustainable agriculture. Among these are well known ecologist M.S. Swaminathan, the ‘Indian father of the Green Revolution’, who worked with Norman Borlaug. He expresses the need for an ‘Evergreen Revolution’ to achieve food security without compromising the long-term health of the land like the movement before did. Swaminathan describes this as “pro-nature, pro-poor, pro-women and pro-employment/livelihood oriented ecoagriculture” (Kesavan), that would provide education on how to switch from overuse of chemical pesticides and water to sustainable agriculture that could mainstream the use of ecological research by the farmers themselves. This type of research would allow sustained general biodiversity and agrobiodiversity and help people thrive on their own land. A movement like this, to perpetually secure India’s food and nutrition supply, should be gradual, so as to avoid unintended consequences such as those faced after the Green Revolution. And as stated in the paragraph above, should provide resilience against climate change while not contributing to it, and have ecological researchers testing every step of the process, ensuring sufficient yields with chemical systems while the switch is being made (creating what Swaminathan calls ‘breathing space’ as the Green Revolution should have been).

To start off, because the environment in every state is so different, a grassroots participatory movement is preferred. One model could be where collector/civil servant of every farming district works with agricultural university extensions or an NGO to start educating the farmers on the benefits and ideas of various forms of sustainable agriculture. Smallholders can at first use small patches of their land as home gardens to try out native seeds and natural pesticides recommended by their NGO, allowing them to get used to the process many years before they employ it seriously. This approach has worked perfectly in Nagapattinam, Tamil Nadu, a coastal farming district where a few farmers saved their crop from drought with the help of Center for Indian Knowledge Systems, their district’s NGO. They learned to test their soil for salinity levels and build farm ponds to make use of their irregular rains, along with planting seeds that were tailored specifically to the region (Balasubramanian). A similar approach was that of the close-by teaching facility, Vanagam, which was founded by local permaculture expert and activist, Nammalvar, and holds monthly seminars on organic farming and agroforestry (Meenakshi). Dumping, too, is a problem that can be addressed by NGOs or nodal agencies, as there could be a chapter that petitions the government for buying more food from local producers, just as many farm bureaus do in the U.S. and in other places around the world.

Ideally, after districts believe themselves ready to use some portion of their land for solely organic agriculture, they can make a policy in the state government that would grant training and transition subsidies to smallholders willing to make the switch. Since training is crucial for converting soil deteriorated by chemical input into rich soil suitable for sustainable agriculture, the state would have to institute nodal agencies to educate farmers in areas that don’t have an NGO. In addition, the state should incentivize and help groups of neighboring farms to turn sustainable since surrounding chemical- using farms can disrupt the environment in organic farms. But without coordination between states, some might move too quickly before they have done the ecological research and education of farmers on how much land can reasonably be converted to using traditional organic fertilizer and pesticide, ending up with tons of crops lost to blight. This was the case in Sikkim, a small state in northern India that switched 100% to organic agriculture in 2016 and has received very low harvests since because of inability to deal with certain types of blights without chemical pesticides. The state also provided very little information to the farmers after banning chemical use on where to get or how to make natural fertilizers and crop medicines (Taneja). To make sure this doesn’t happen in other places, The Indian national government should earmark a portion of its tax revenue to fund and manage these solutions.

With very little changes being made by the government to ensure access to balanced nutrition, and the threat of an ever- climbing population in urban areas to feed, instating sustainable agriculture may not seem like the most realistic approach; but many farming communities, and some states, e.g., Kerala, Karnataka, Maharashtra, Madhya Pradesh, Gujarat, Rajasthan, Nagaland, Mizoram and Sikkim have already put policies in place embracing sustainability to survive effects of climate change. And with the large influx of people from rural areas into cities because of inability to see a future for themselves, policies that give them the opportunity to stay on their farms are more urgent than ever. Rural flight used to be considered a necessary step to follow the path to development followed by Western and some far East Asian nations. However, that path to development, fueled by increased consumption, waste, and a high carbon footprint, now looks increasingly unsustainable for the planet's climate. The farmer suicides, unrest, and political movements before the 2019 Indian elections give ample signals to the Indian government to fund, monitor, and nurture these grassroots and states' initiatives for sustainable agriculture that ensures food security in both rural and urban areas. In such a historically agro dependent culture and economy as India's, sustainability empowers the farmer as well as it does the land, and embraces the challenge of scientific, educational, cultural, and economic innovation that our changing ecosystems will require as we move into the next decade.

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